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Assessment
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International Energy Biweekly Review

23 August 1978

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23 August 1978

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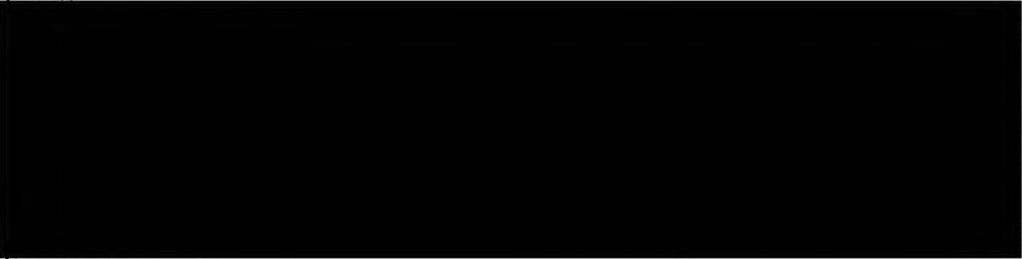
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INTERNATIONAL ENERGY BIWEEKLY REVIEW

23 August 1978

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INTERNATIONAL ENERGY BIWEEKLY REVIEW

Overview

Some international oil companies plan to begin speculative buying of crude oil earlier this year than in previous years. An oil price increase by January 1979 appears inevitable; several companies expect it to be on the order of 10 percent. They are concerned that some OPEC countries will restrict anticipatory company liftings of crude. They are also aware that supplies in Saudi Arabia will be tighter than in the past.

Saudi output is not expected to increase significantly for the remainder of the year, mainly because of restrictive operating rules imposed earlier this year by the Petroleum Ministry. The restriction called for the ratio of Arab Light to total Aramco output to amount to 65 percent on an annual basis. Initial misunderstanding of how this restriction was to be applied caused Aramco shareholders to overlift more than 300,000 b/d of this oil in the first half of 1978. The companies will have to compensate for their overlift before yearend by holding down output of Arab Light.

Aramco already is producing close to capacity levels in other types of crude (Arab Medium, Arab Heavy, and Berri) and does not have the flexibility for further shifts in the immediate future. Only about 300,000 b/d in new capacity will be added later this year when a new gas-oil separating plant begins operation at the Zuluf (medium crude) field. This will be partially offset by reductions in sustainable capacity at other fields, including Safaniya (heavy crude). Aramco's average production for second half 1978 is projected by two shareholder companies at 7.3 to 7.5 million b/d, with no allowance for substantially higher production toward the end of the year. The restrictions in Saudi Arabia are likely to shift demand elsewhere and could temporarily tighten available crude supplies and strengthen OPEC price expectations.

The sentiment among a large majority of OPEC countries clearly favors some form of compensation for import inflation and the declining dollar. Saudi Arabia probably will be less disposed to argue for a continued price freeze than at any time in the last three years. Oil Minister Yamani has reiterated his previously stated view that the appropriate price path for oil is a series of gradual increases that should begin soon. He indicated that market conditions were likely to tighten before the end of the year,

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making such an increase difficult to resist. Iran, which cooperated in holding the line against a price rise in 1978, also clearly will favor an increase in 1979.

Officials of the OPEC Secretariat strongly deny rumors that an extraordinary high-level meeting of the 13 member countries will be convened in September to adopt some form of price revision. Several key OPEC states, including Saudi Arabia, would prefer to defer any decision on prices until the December meeting of cartel oil ministers in Caracas. (Secret Noform-Nocontract)

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SAUDI ARABIAN OIL EXPORT POLICY: IMPACT ON THE OIL MARKET

In February 1978, Saudi Arabia announced a policy of shifting its crude export mix toward more heavy crudes. Aramco was ordered to reduce the share of its Arab Light crude to 65 percent of the total oil flow. Saudi spokesmen have indicated that the action is designed to bring the Saudi production mix more in line with the proportion of crudes in its reserves. In addition, the resultant slowdown in light crude output is consistent with the Petroleum Ministry's view that the giant Ghawar field should be produced at a lower rate of production. This article will examine the impact of this decision on Aramco liftings and the international oil market.

The decision by Saudi Arabia to alter its oil output mix toward heavier crudes should increase demand for light crudes from other sources and tighten somewhat the current weak market for OPEC oil. Under existing production rules imposed by the Saudis, productive capacity in the Aramco area is insufficient to permit any wide swings in overall output for the remainder of 1978. Moreover, the difficulty of selling higher proportions of heavy crude in the current market is inhibiting demand for Saudi oil. Light crude acquisitions from Saudi Arabia have fallen sharply; Aramco shareholders and third party buyers have been forced to meet requirements from alternative suppliers.

At least two of the Aramco shareholder companies forecast an OPEC price increase on the order of 10 percent by yearend—an action that usually precipitates an anticipatory surge in crude oil liftings. In past years, Saudi Arabia has been a key supplier of advanced liftings. Advanced liftings from Saudi Arabia in fourth quarter 1976, for example, were about 1 million b/d. This year, however, will be an exception. The consortium's average production for second half 1978 is projected at 7.3 - 7.5 million b/d with no allowance for substantially higher production toward the end of the year. Customers reluctant to take 35 percent medium and heavy crude are likely to shift demand elsewhere. Although other countries may not be called upon to absorb the entire volume of oil sales that otherwise would have been made by the Saudis, the market could temporarily tighten before yearend.

The impact of reduced Saudi crude oil on the international refining industry in the near term is manageable. Spare light crude capacity in several countries and the additional supplies of light North Sea crude coming onstream will enable refiners to satisfy product mix requirements. In the longer term, the Saudi action will encourage long-delayed investments in secondary refining equipment needed to process larger volumes of heavy, high-sulfur crudes.

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Saudi Production Rules

For several years, Saudi Arabia's petroleum ministry has talked of altering the composition of crude output so that ratios would eventually approximate the distribution of oil reserves. Saudi Arabia's most abundant crude is Arab Light, a 34 degree (API) gravity crude which comprises 43 percent of proved and probable oil reserves but constituted 72 percent of Saudi output in 1977. Arab Light has been disproportionately produced because of: (1) its desirability on the world oil market relative to other Saudi crudes, (2) its ready accessibility from a couple of major oilfields (Ghawar and Abqaiq), which historically had exceptionally low capital costs, and (3) the discovery of these fields in the early period of Saudi oil development.

Saudi Arabia: Crude Oil Production by Type

	Total Aramco Production (Thousand b/d)	Arabian Light (Thousand b/d)	Percent of Total	Arabian Berri (Thousand b/d)	Percent of Total	Arabian Medium (Thousand b/d)	Percent of Total	Arabian Heavy (Thousand b/d)	Percent of Total
1966	2,390	1,575	65.9	0	0	220	9.2	595	24.9
1967	2,600	1,910	73.5	0	0	195	7.5	495	19.0
1968	2,835	2,250	79.4	0	0	130	4.6	455	16.0
1969	2,990	2,265	75.8	0	0	260	8.7	465	15.6
1970	3,550	2,485	70.0	20	0.6	255	7.2	790	22.3
1971	4,500	3,325	73.9	160	3.6	235	5.2	780	17.3
1972	5,735	4,025	70.2	420	7.3	285	5.0	1,005	17.5
1973	7,330	5,385	73.5	580	7.9	420	5.7	945	12.9
1974	8,210	6,000	73.1	625	7.6	545	6.6	1,040	12.7
1975	6,825	5,515	80.8	415	6.1	220	3.2	675	9.9
1976	8,340	6,500	77.9	750	9.0	245	2.9	845	10.2
1977	9,020	6,480	71.8	700	7.8	490	5.4	1,350	15.0
1978	7,500	4,880	65.1	600	8.0	2,020		26.9%	

Technical officials in the petroleum ministry decided in October 1977 that oil output at Ghawar should be substantially pared to hasten pressure restoration. This cut dovetailed with the longstanding conservationist concerns on oil reserve drawdowns. Moreover, the market was slack and Saudi Arabia's OPEC partners were pressing for price increases to offset the revenues being lost because of lower exports. By November 1977, oil minister Yamani apparently had approved a decision to limit Arab Light crude to 65 percent of 1978 output—a decision that served simultaneously to lower output from Ghawar, conserve Arab Light, and enhance the export prospects of other OPEC countries.

The Saudis further decided in January 1978 that production mix guidelines would be strictly enforced at an average annual level that must be reconciled at the

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- Aramco was not formally notified of the production ratio until mid-February 1978.
- The company was not informed until April that the measure was retroactive to 1 January.
- Until May, Aramco operated under the impression that the ratio would be applied to the existing 8.5 million b/d overall production ceiling rather than actual production.

Impact on Saudi Oil Output

The maximum amount of Arab Light that can be produced under ratio guidelines is 5.5 million b/d, 65 percent of the 8.5 million b/d ceiling. This assumes that other types of crude produced by Aramco (Arab Heavy, Arab Medium, and Berri) average 3.0 million b/d (the remaining 35 percent). Because of limited development or production restrictions at fields which produce these other types of crude, available capacity outside the Arab Light fields barely approximates this level.

The retroactive notification on implementation of the ratio restriction caused the company to allow substantial overliftings. During the first half 1978, production of Arabian Light averaged about 5.3 million b/d, more than 69 percent of total Aramco

Aramco: Crude Oil Production, by Type, 1978

	Thousand b/d			Percent of Total Production
	1st Qtr	2d Qtr	1st Half	(1st half)
Arabian Light	5,725	4,795	5,260	69.4
Arabian Berri	575	585	580	7.7
Arabian Medium	390	640	515	6.8
Arabian Heavy	1,060	1,380	1,220	16.1
Total Aramco	7,750	7,400	7,575	100.0

output. But a sharp tightening by the company management beginning in May caused Arabian Light production in June to fall to 4.3 million b/d or 59 percent and Aramco will have to hold Arab Light output down for the remainder of the year to compensate for the overlift in the first half.

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The Aramco shareholders have agreed that each parent company is responsible for keeping the ratio of its export stream in balance. Aramco is authorized to refuse monthly nominations that run over the quota. Mobil and Exxon lifted a greater proportion of Arab Light in the first part of the year than did Standard Oil of California and Texaco; the former two companies will be somewhat more restricted in the fourth quarter.

The enforcement of the crude type ratios and other rules has led to a drop in Ghawar's oil output to about 3.6 million b/d in May and June 1978 compared to an average of 5.3 million b/d in 1977. Although productive capacity will be added over the near term at some fields which produce other than Arab Light crude, the Saudis probably will gradually implement more stringent ratio rules than the 65 percent one now in force. The net effect is that sustained production at Ghawar is not likely to increase sharply within the next couple of years; and availability of Arab Light crude from Saudi Arabia is not likely to rise substantially.

Oil Market Impact

The Saudi move to reduce light crude oil output should help tighten the current weak oil market and increase demand for light crudes. Moreover, if the Aramco partners do not significantly expand Arab Heavy and Medium crude production, total Saudi output should remain below the production ceiling.

OPEC oil output was down sharply in first half 1978 but should rebound strongly during the second half. OPEC output, including 750,000 b/d of natural gas liquids (NGL), fell to about 29 million b/d during first half 1978—down nearly 3 million b/d from the 1977 average. Saudi crude output led the decline as production fell about 15 percent, dropping nearly 1.4 million b/d.

Second half demand for OPEC oil is expected to average about 32 million b/d (including NGL)—nearly 3 million b/d above first half levels. The large buildup in oil stocks that occurred late last year has been worked off. Free World oil consumption in January-May was 3 percent above year earlier levels. Preliminary data for May indicate consumption was 4 percent above the previous year. The oil market will be bolstered in the second half by a spurt in US oil import demand now that the Alaskan oil flow has leveled off. US oil imports are expected to rise about 400,000 b/d in second half 1978.

By fourth quarter 1978, demand for OPEC oil should strengthen even further and average between 32 and 33 million b/d (including NGL). In calculating this increased demand, toward yearend, we assume: (1) normal fourth quarter seasonally

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OPEC Countries: Crude Oil Production ¹

	1977	1978						Available Capacity	Underutilization of Productive Capacity (2d Qtr)
		1st Qtr	Apr	May	Jun	Jan-May	2d Qtr		
Saudi Arabia ²	9,020	7,750	7,840	7,090	7,290	7,630	7,400	8,500	1,100
Iran	5,660	5,470	5,610	5,720	5,630	5,550	5,650	6,500	850
Iraq	2,330	2,130	2,300	2,000	2,100	2,140	2,130	3,000	870
Venezuela	2,240	1,830	2,230	2,220	2,320	1,990	2,260	2,300	40
Nigeria	2,100	1,580	1,690	1,720	1,890	1,630	1,770	2,300	530
Libya	2,080	1,820	1,870	1,930	2,000	1,850	1,730	2,300	370
UAE	2,010	1,820	1,750	1,870	1,840	1,830	1,820	1,870	50
Abu Dhabi	1,660	1,440	1,370	1,480	1,450	1,440	1,430	1,460	30
Dubai	320	350	360	370	370	360	370	360	10
Sharjah	30	30	20	20	20	30	20	50	30
Kuwait	1,780	1,670	1,780	1,650	1,740	1,690	1,720	2,000	280
Indonesia	1,690	1,700	1,680	1,700	1,620	1,700	1,670	1,700	30
Algeria	1,040	1,000	1,000	1,000	1,000	1,000	1,000	1,080	80
Qatar	430	450	510	380	450	450	450	600	150
Neutral Zone	370	380	420	320	380	380	380	600	220
Gabon	230	220	220	220	220	220	220	225	5
Ecuador	180	180	230	200	210	190	210	225	15
OPEC Total	31,160	28,000	29,130	28,020	28,680	28,250	28,610	33,200	4,590
Excluding Saudi Arabia								24,700	3,490

¹ Excluding natural gas liquids.² Excluding share of Neutral Zone production.

high demand, and (2) no drawdown in petroleum stocks—a reversal of normal seasonal inventory reductions—because buyers will be anticipating a 1 January 1979 OPEC price increase, and (3) a continuation of US and Japanese demand for government strategic oil storage.

The higher fourth quarter demand could tighten the oil market considerably. With Saudi output expected to average only about 8.1 million b/d (7.6 million b/d for Aramco, 300,000 b/d of NGL, and 200,000 b/d from the Neutral Zone) other members of OPEC would be required to produce about 24 million b/d—close to the current available productive capacity. Since stocks would be unseasonably high, however, oil availability to consumers would not likely be curtailed. Moreover, the tightness in the market would be short lived, easing considerably in first quarter 1979 when stocks would be drawn down and OPEC production slackens.

Some international oil companies are considering beginning their anticipatory liftings unusually early this year out of a concern that, OPEC members might

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themselves prepare for higher prices by limiting production surges in the fourth quarter. For many OPEC producers, large advanced sales are generally followed by sharp drops in output after price increase takes effect and buyers begin working off stocks. The oil exporting countries, therefore, stand to gain in revenue from selling later at the higher prices. Moreover, unsatisfied speculative demand creates the illusion of a tight market and reinforces demands for higher prices.

As a result, OPEC exports may increase before the end of the third quarter, and the fourth quarter advance might not be as large as in some earlier cases. The companies will weigh the costs of hedge buying (about 15-20 cents per barrel each month to cover storage and financing) against the size of the price increase they expect (\$1.27 per barrel of Saudi benchmark crude if a 10 percent increase is adopted).

Crude Oil Supplies

The additional supplies of non-OPEC crude which are expected to come on stream this year along with the current excess capacity will ease the impact of the Saudi restrictions on Arab light output in the near term. The North Sea will continue to supply large volumes of higher quality crudes which will enable many refineries to offset the decline in the availability of Arab Light. A 700,000 b/d gain is expected in the North Sea this year. Mexican crude, similar in quality to Arabian Light, is also being looked to as a possible replacement, and output in Mexico is expected to rise nearly 400,000 b/d this year.

Spare capacity of nearly 1.8 million b/d is currently available in four key OPEC countries—Iraq, Nigeria, Libya, and Algeria.

To examine the effect of the Saudi output mix requirement on the oil market, we divided crude production OPEC into three categories by gravity:

- Heavy crudes are considered to be all crudes with an API gravity below 32 degrees. Included in this group will be both Arabian Heavy (27 degrees) and Arabian Medium (31 degrees).
- Medium crudes are all those of 32 degrees through 36.9 degrees gravity. Arabian Light (34 degrees) is included in this group.
- Light crudes are those 37 degrees and above. Arabian Berri (39 degrees) is included in this group.

The countries that ostensibly stand to be hurt the most from the Saudi output mix requirement are the heavy crude oil producers. Iran, Venezuela, and Kuwait produce

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much of the world's heavy, high-sulfur crude oil. The drop in overall Saudi output, however, has helped minimize the impact on heavy crude oil producers. Saudi Arabia, the second largest producer of heavy crude oil in OPEC, has been unable to significantly expand production of Arab Medium and Heavy crude oil. This has contributed to an upward trend in the oil output in most other heavy crude oil producing countries in recent months.

OPEC Countries: Heavy ¹ Crude Oil Production, 1977

	Production (Thousand b/d)	Percent of Country's Total Production
Total	10,610	34.0
Iran	2,660	47.0
Kuwait	1,780	100.0
Saudi Arabia.....	1,840	20.4
Venezuela	1,630	72.8
Nigeria	1,060	50.5
Indonesia.....	410	24.1
Neutral Zone	330	88.9
UAE	320	15.9
Dubai	320	100.0
Iraq	250	10.7
Ecuador.....	180	100.0
Gabon	150	66.4

¹ Less than 32° API gravity.

Liftings of Iranian Heavy (31 degrees) crude remained relatively unchanged during first half 1978, compared to full year 1977. Kuwait, which produces only a heavy export blend, also managed to maintain production by cutting its price (differential) by 15 cents per barrel. Kuwaiti output averaged almost 1.7 million b/d, down less than 100,000 b/d from its 1977 annual rate.

Venezuela, another major producer of heavy crude, has not been adversely affected by the Saudi restrictions primarily because of its favorable proximity to the US market. Output in early 1978 had been running well below 1977 levels because oil companies were working off stock built up last year. Venezuelan production has recovered in recent months and averaged more than 2.3 million b/d in June.

Nevertheless, the market is glutted with fuel oil as evidenced by falling spot market prices. Consumption of heavy fuel oil is weak due to sluggish industrial output and substitution of alternative energy sources. At the same time, light product demand is rising. Refineries are forced to accumulate large excess stocks of heavy fuel oil, which they are having difficulty working off because of the volumes produced as they refine crude to obtain light products.

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Along with the expected upturn in oil import demand anticipated later this year, demand for heavy crude oil should pick up sharply in late summer when companies begin rebuilding inventories for the 1978-79 winter.

Medium crude producers stand to benefit the most from Saudi restrictions on the production of Arabian Light. Liftings of Iranian Light (34 degrees) increased nearly 20 percent in second quarter 1978 compared with first quarter. As overall demand increases, production of Iranian Light will provide some flexibility for those refineries forced to substitute for Arabian Light.

Iraq, another major producer of medium crudes, has not yet benefited from the Saudi cutbacks. Iraqi production has fluctuated between 2.0 and 2.3 million b/d during the first 6 months of 1978. With almost 900,000 b/d of spare capacity available, Iraq could be an important source of medium crude as supply tightens.

OPEC Countries: Medium ¹ Crude Oil Production 1977

	Production (Thousand b/d)	Percent of Country's Total Production
Total	13,790	44.3
Saudi Arabia	6,480	71.8
Iran	3,000	53.0
Iraq	2,080	89.3
Indonesia	850	50.3
Venezuela	540	24.0
Nigeria	500	23.8
Qatar	120	27.9
UAE	80	4.0
Abu Dhabi	80	4.7
Gabon	50	22.1
Neutral Zone	40	11.1
Libya	30	1.6
Algeria	20	2.1

¹ 32.0° - 36.9° API gravity.

There has already been some indication that refineries will begin to look to Iraq rather than Saudi Arabia for incremental crude supplies especially if they are required to take a percentage of heavier Saudi grades along with Arabian Light. Baghdad has indicated, however, that restrictions may be placed on the amount of crude available in the fourth quarter.

The major African crude producers were forced to lower prices in both the first and second quarters in order to maintain sales. Nigeria has offered an additional discount to buyers willing to meet specified minimum lifting commitments in the third quarter. Output, which had fallen substantially during late 1977 and early 1978 due to increased supplies of high quality North Sea crudes, has grown in recent

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OPEC Countries: Light ¹ Crude Oil Production, 1977

	Production (Thousand b/d)	Percent of Country's Total Production
Total	6,760	21.7
Libya	2,050	98.4
UAE	1,610	80.1
Abu Dhabi	1,580	95.3
Sharjah	30	100.0
Algeria	1,020	97.9
Saudi Arabia	700	7.8
Nigeria	540	25.7
Indonesia	430	25.6
Qatar	310	72.1
Venezuela	70	3.2
Gabon	30	11.5

¹ 37.0° API and higher gravity.

months in response to the price reductions and Saudi restrictions. Nevertheless, production remains below last year's levels. About one-half of Nigeria's capacity is in heavy crudes with a very low sulfur content which makes them very competitive. These crudes should not be directly affected by the Saudi restrictions.

Light crude producers in general should benefit because their crudes are generally suitable for blending with Saudi heavy crude supplies. Libya, the largest producer of light crude in OPEC, probably will make some gains from the Saudi restrictions. In the Persian Gulf, Abu Dhabi is the leading producer of light crude; however, the Emirate already is producing close to a recently imposed government ceiling.

Price Trends

The limitations on Saudi light output have bolstered spot market prices of alternative Middle East crudes while heavy crude oil prices remain weak. Spot prices of light crudes from Saudi Arabia, Iran, and Iraq have risen from 9-15 cents per barrel in the past few months. A reduction in the credit terms offered on Arabian Light have in effect increased its spot price to \$12.79 per barrel. Spot sales of Arabian Light are being tied to the purchase of specified volumes of Arabian Heavy. With large volumes of Arabian Heavy being made available, its spot price has continued to weaken, primarily through the extension of credit terms. Credit terms have ballooned from 90 days in second half 1977 to as much as 150 days currently. Each additional 15 day period is worth about 3-4 cents per barrel.

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Trends in spot prices, when discernible, are usually a good indicator of future changes in differentials (reflecting differences in quality and transportation costs of various crudes). OPEC countries are waiting for the market to adjust before taking any additional steps to remedy the gap between market values and official differentials. In general, heavier crudes yield relatively more heavy products (fuel oil, asphalt, and heavy gas oil) than light crudes which yield a greater proportion of light products (gasoline, naphtha, kerosene, and diesel fuel).

Since light products, e.g., gasoline, often require more costly refining processes, they are priced higher relative to heavy products which approach the residual portion of the barrel. Therefore, crude lighter than Saudi benchmark (above 34 degrees API) has usually sold for more than benchmark while heavier crudes (below 34 degrees API gravity) have sold for less. Concomitantly, products with less sulfur burn cleaner and are considered more desirable. Therefore, crudes with a lower sulfur content have an increased value. Since Saudi benchmark crude has a sulfur content of 1.7 percent, the sulfur differential of other crudes are determined by their relationship to this figure.

The disadvantage to refiners of the Saudi ratio restriction on crude types is caused by the oversupply of heavy products. Aramco now requires all of its customers to accept a certain volume of Arab Medium or Heavy with each purchase of Arab Light. Aramco shareholders and third party buyers not only must evaluate the return on each barrel of Arab Light they intend to run through a refinery, but also must calculate the costs that must be absorbed in taking each barrel of Arab Heavy or Medium. Although, Saudi Arab Light crude appears price competitive with other similar crudes per se, e.g., Iranian Light, this requirement diminishes its true value. The obvious remedy is to lower prices on Saudi heavy crudes so that each of the crudes remains competitive. However, this is not a company decision, it is one that Saudi Arabia will have to consider. If Riyadh were interested in increasing sales volume, it could adjust its price differential. Thus far, the Saudis do not appear sufficiently concerned about sales volumes to make this move.

Oil Refining

In the near term the international refining industry will be able to adjust easily to the new Saudi production mix restrictions. Many primary and some secondary refining facilities are either shut down or operating below capacity and there is flexibility in the international refining industry to handle modest changes in crude supply streams without serious disruptions.*

* This flexibility involves such factors as secondary refining facilities which enable a refinery to alter significantly the product yield and specifications from a given barrel of crude; the ability of major companies to coordinate refining operations of a number of refineries to meet their total product demand; and the ability of major companies to transport crude end products for blending and other purposes.

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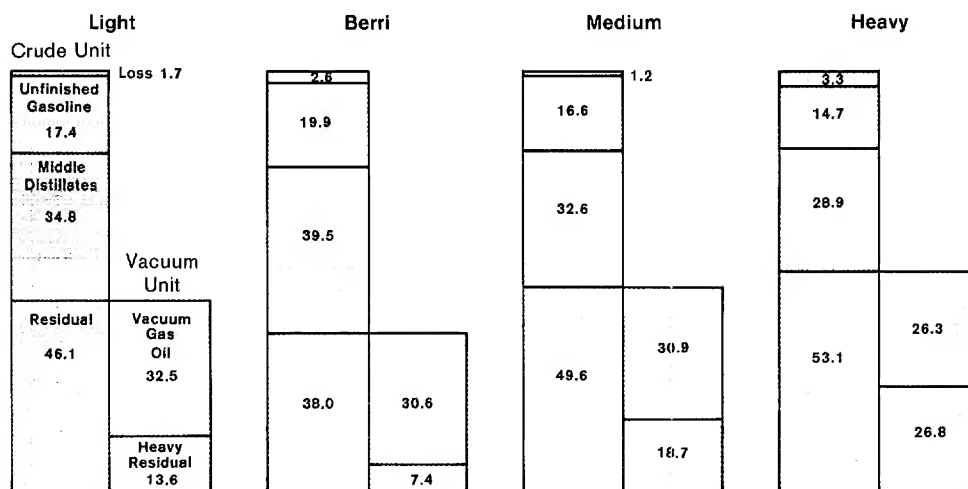
Nevertheless, selected refiners may have to handle larger proportions of heavy crude than they would prefer with a resulting rise in their high sulfur fuel oil output.

With the basic crude distillation process common to most refineries outside of the United States, Arab Heavy crude yields about 15 percent more fuel oil than Arab Light. The yield of distillate is about 17 percent lower and the gasoline/naphtha volume about 16 percent less. Moreover, the sulfur content of residual fuel oil from Arab Heavy crude is about 1.25 percent higher than that from Arab Light.

The most modern refineries are equipped with vacuum distillation units which reduce the residual yield significantly but at different rates for different crudes, i.e., about 70 percent on Arabian Light but only 50 percent on Arabian Heavy. Many also include cracking and other secondary facilities which further increase gasoline and distillate yields and reduce fuel oil yields. By use of a coker, for example, about 70 percent of the heavy residual from the vacuum unit can be converted into gasoline and distillate, with the remainder being coke.

Representative Yields from Saudi Arabian Crude

Percent



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Although modern secondary refining techniques—catalytic and other types of cracking in particular—can alter the mix of products produced from a given crude oil, investment in the required facilities is costly,* and most West European refineries are not equipped to do this further processing. Indeed, because European demand traditionally has grown faster for heavy fuel oil than other major products, and suitable crudes were available, catalytic cracking capacity accounts for about 5 percent of total refining capacity in Western Europe. Most European refineries thus have limited flexibility to make significant changes in the product mix except by changing the gravity of the crude refined.

The European refining industry shifted gears following the 1973 oil crisis. Faced with surplus refining capacity and an expected shift in the composition of refined product demand toward more lighter products, European refineries began plans for expanding cracking capacity.

According to a recent industry study, about 540,000 b/d of new cracking capacity is under construction or planned in the European Community (EC). The total outlay for this is estimated to be more than \$3.5 billion. Based on current plans, cracking capacity in the EC countries will reach 2 million b/d in 1982 compared with 1.4

EC: Petroleum Cracking Capacity by Type

	Installed Capacity 1 Jan 1978	Under Construction or Planned (Indicated Year of Completion)				Thousand b/d Forecast Capacity 1 Jan 1982
		1978	1979	1980	1981	
Fluid Catalytic Cracker ..	840	82	83	110	32	1,147
Thermal Cracker	316	36	5	0	0	357
Visbreaker	192	50	94	37	0	373
Hydrocracker	76	14	0	0	0	90
Total	1,424	182	182	147	32	1,967

million b/d on 1 January 1978. About 40 percent of the increase will result from revamping oil crude units and their heaters, eliminating some of the surplus primary distillation capacity. The EC accounts for about 80 percent of Western Europe's refining capacity. Projects in non-EC Europe, particularly in Spain, will push the new cracking capacity higher by the end of 1981.

Saudi Arabia's move to adjust its output mix should encourage refineries to accelerate investments in sophisticated refining equipment needed to process larger volumes of heavy high sulfur crude oil while meeting the mix of refined product

* See technical note at the end of this article.

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demand. Oil Minister Yamani indicated in Geneva in June that Saudi Arabia's light-heavy crude oil export balance may be tipped further toward the heavy end in the future. Moreover, the composition of future oil product consumption will reinforce the need for additional cracking capacity. Light oil product demand growth is expected to outpace demand for heavier products.

In markets like the United States, sulfur limitations complicate the ability of refiners to handle additional quantities of Arabian Heavy. In the United States, available sweet crude supplies are declining, and the capacity to handle sour (sulphurous) crudes needs to be increased through 1981 at a rate of about three times that of the past four to five years. Although the United States has most of the world's catalytic cracking capacity, this capacity was designed to use sweet (low sulfur) crude and would corrode if charged with the sour heavy crudes now in excess supply.

The high sulfur heavy crude glut could be reduced by large increases in catalytic cracking and desulfurization facilities. Although companies have plans to increase the needed capacity, the current poor operating environment has discouraged new investments. Moreover, even if refiners began constructing cracking facilities today, it would be 1980 or so before they could be put on line.

Technical Note

- Primary distillation capacity charges crude oil and separates it into a few basic fractions, usually naphtha (unfinished gasoline, middle distillates, and residual). The capacity of the crude unit determines the size of the refinery. In most cases, yields from the crude unit are considered unmarketable and require further refining, treating, or blending.
- Secondary facilities charge the output of the primary facility or of other secondary facilities to make finished marketable produce. The construction and operating costs of these units is much higher than the primary unit. The cracking units convert heavier products into lighter ones. Reforming converts naphtha into high octane gasoline and hydroprocessing mainly removes sulfur.
- Vacuum distillation is the most common secondary process. It charges residual from the crude unit from which it extracts additional distillate (vacuum gas oil) leaving a heavy residual as the remaining material. (Secret Noform-Nocontract-Orcon)

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OPEC WEIGHS CURRENCY BASKET OIL PRICING

The OPEC committee of financial experts that met in London 14-17 July to discuss the effects of the decline of the US dollar recommended indexing oil prices to the Geneva II basket of currencies. Saudi Arabia and the UAE stood alone in opposition. Iran remained neutral at the meeting but is expected to come around to the indexation side when the political climate is more favorable.

To be implemented, the plan must be adopted at the scheduled OPEC policy meeting in December or at an extraordinary meeting that some OPEC price hawks hope to convene in September. Even if an extraordinary meeting is held, Saudi dissent is sufficient to delay all price increases until January and to moderate the size of the eventual increase.

The majority of the OPEC experts meeting in London agreed on a new oil pricing arrangement that has these features:

- Oil revenues would continue to be collected in US dollars.
- Oil export prices would continue to be quoted in US dollars.
- Dollar oil prices would be adjusted to match the value of a basket of currencies.
- The dollar oil price would be adjusted on 1 October 1978 and then readjusted annually or quarterly if the currency basket deviated by more than 1 percent from the previously pegged base.
- Oil prices would be based on the currency basket values with a December 1976 parity.

The currency basket that won the support of the London meeting was the original eleven country Geneva II basket modified to include the US dollar and weighted according to OPEC imports from the countries whose currencies are included. The Special Drawing Right (SDR) of the International Monetary Fund was rejected as a currency basket on which to base oil prices because it was considered too heavily weighted with the dollar. Since the last general oil price hike in January 1977, the modified Geneva II basket has appreciated against the dollar twice as fast as the SDR.

The committee was very concerned about the impact OPEC decisions might have on the US dollar and on the world economy. All of the experts acknowledged that a

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Suggested Currency Baskets for Pricing Oil:
Shares of Included Currencies

		Percent
	SDR ¹	Recommended Geneva II Basket Import Weighted
Australian dollar	1.5	1.2
Austrian shilling	1.0	0
Belgian franc	3.5	2.6
British pound	9.0	10.0
Canadian dollar	6.0	1.9
Danish krona	1.5	0
Dutch guilder	4.5	3.4
French franc	7.5	9.9
Italian lira	6.0	8.3
Japanese yen	7.5	18.1
Norwegian krone	1.5	0
South African rand	1.0	0
Spanish peseta	1.5	0
Swedish krona	2.5	2.0
Swiss franc	0	2.2
US dollar	33.0	24.5
West German mark	12.5	16.1

¹ The composition of the SDR was revised on 1 January 1978. The Danish krona and the South African rand were replaced with the Saudi Arabian riyal and the Iranian rial.

Alternative Pricing of Saudi Bench Mark Crude

			US \$ Per Barrel
	Dollar Price ¹	SDR Price	Recommended Geneva II Basket Including US Dollar
1976			
4th Qtr	11.27	11.27	11.27
1977			
1st Qtr	11.84	11.86	11.92
2nd Qtr	11.84	11.91	12.03
3rd Qtr	12.44	12.57	12.78
4th Qtr	12.44	12.77	13.20
1978			
1st Qtr	12.50	13.21	13.75
2nd Qtr	12.50	13.27	13.94

¹ Price paid by Aramco partners. Third party buyers pay the official sales price currently set at \$12.70 per barrel.

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switch to currency basket indexation might have a psychological impact that would temporarily weaken the dollar. All except the Saudis, however, argued that indexation would provide an incentive for other countries to support the dollar in order to avoid triggering oil price increases. They also believed that the US trade balance would be harmed proportionately less by oil price rises than would the trade balances of other major countries—an effect that would tend to strengthen the dollar relative to the other major currencies. (Secret Noform-Orcon)

* * * * *

SAUDI ARABIA: OIL RESERVES IN THE UNTAPPED OILFIELDS

Although Saudi Arabia contains the largest accumulation of known oil reserves in the world, a great many misconceptions persist concerning the size and location of these deposits. This article examines the distribution of Saudi oil reserves, particularly in the large number of reservoirs which have yet to be produced, and describes development activity to date.

In recent press releases, Aramco has cited the existence of 37 oilfields in Saudi Arabia, only 15 of which have ever produced oil. The impression conveyed by these statements is that the 22 unproduced fields contain vast untapped oil deposits rivaling those of the major fields now being produced. In reality, the combined reserves of these virgin reservoirs amount to only a small fraction of the Saudi total.

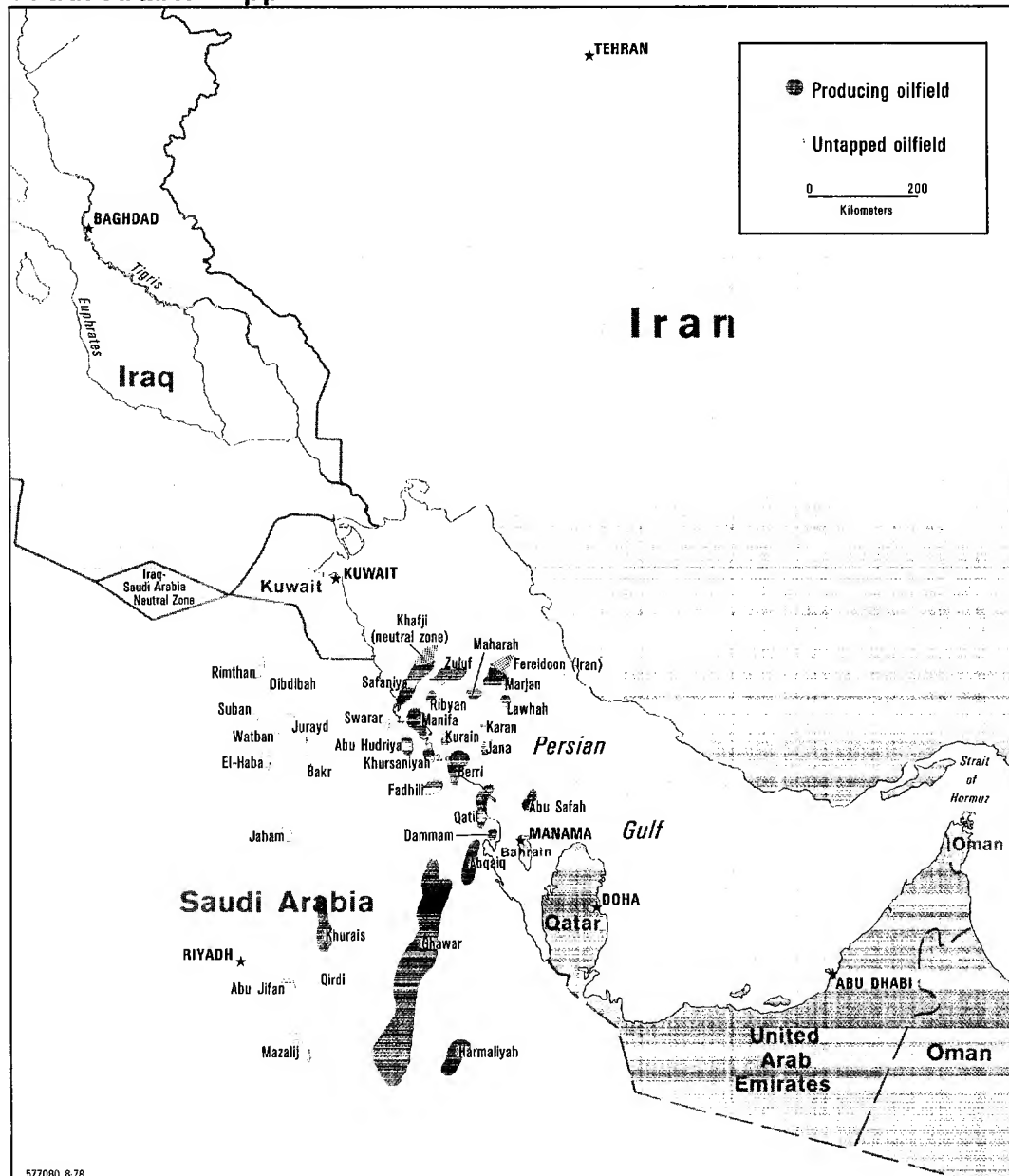
Reserves by Field

Aramco estimates its *proved* reserves (which exclude the Neutral Zone) at 110.4 billion barrels at the end of 1977. The 15 producing fields contain 105.6 billion barrels (96 percent); the other fields are estimated to have less than 4.8 billion barrels in the proved category. Estimates of proved reserves by their nature are conservative. Because many of the 15 fields now in production have been extensively drilled and studied, a relatively high proportion of their total reserves already has been identified as “proved.” The untapped oilfields, on the other hand, have had only limited development and “proved” totals are likely to rise significantly.

Aramco estimates its *probable* reserves (including the “proved” category) at 177.6 billion barrels. The 15 producing fields contain 165.2 billion barrels (93 percent); the other fields are calculated to have probable reserves of 12.4 billion barrels. Unlike proved reserves, the probable category is not necessarily conservative. Indeed, as untapped reservoirs are developed and better understood, probable reserves in some fields might be revised downward.

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Saudi Arabia: Approximate Location of Oilfields



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Saudi Arabia: Aramco Estimate of Oil Reserves in the
Producing Oilfields, Year End 1977

Field	Billion barrels		
	Proved Reserves	Probable Reserves ¹	Possible Reserves ²
Total	105.6	165.2	225.4
Ghawar	49.1	65.1	80.8
Abqaiq	3.9	7.0	9.0
Fadhili	0.4	0.7	1.2
Abu Hadriyah ..	0.9	1.4	1.9
Harmaliyah	0.9	1.1	1.6
Damman	0.5	0.6	0.8
Qatif	2.6	7.0	11.5
Marjan	1.3	6.0	9.8
Zuluf	5.2	13.8	18.1
Abu Safah	3.7	4.5	6.7
Khurais	5.1	10.5	12.5
Khursaniyah	1.9	2.0	4.3
Safaniya	14.1	25.2	37.5
Manifa	8.5	9.6	14.9
Berri	7.3	10.6	14.8

¹ Including Proved Reserves.² Including Proved and Probable Reserves.

Aramco also has a category of *possible* reserves, estimated at 247 billion barrels. This figure is calculated by the same method as probable reserves, but assumes the application of enhanced recovery techniques to increase the amount of oil-in-place that will ultimately be recovered. About 225.4 billion barrels (91 percent) of possible reserves are found in the 15 oilfields currently being produced. The 22 untapped oilfields contain only 21.5 billion barrels (9 percent) of possible reserves.

Development Activity

Aramco historically has found more oil each year than it has produced, but production (3.3 billion barrels) and reserve additions in 1977 were approximately the same. Exploratory drilling was virtually at a standstill last year. Reserve additions came from development work at the 15 producing oilfields and primarily involved shifting crude reserves from one category to another.

Although several of the untapped fields are in close proximity to producing reservoirs, Aramco has not moved to develop them. Their potential output would be more costly to develop, per barrel of daily capacity, than fields now producing. The Saudis earlier had pressed to have some of these fields brought on line but have agreed in the last year or so to set aside this effort, at least for the time being.

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Saudi Arabia: Aramco Estimates of Oil Reserves in the
Untapped Oil Fields

Field	Million Barrels		
	Proved Reserves	Probable Reserves ¹	Possible Reserves ²
Total	4,750	12,446	21,505
Shaybah	2,852	4,664	9,329
Rimtham	452	964	1,982
Mazali	338	1,162	1,493
Abu Jifan	279	759	976
Lawhah	276	1,330	1,817
Jurayd	163	302	755
Suban	72	124	218
Maharah	72	1,231	1,456
El Haba	57	121	355
Jana	43	190	558
Bakr	37	75	155
Qirdi	36	99	141
Sharar	25	482	902
Ramlah	15	107	220
Karan	10	91	184
Ribyan	9	613	700
Dibdibah	7	73	152
Habari	3	6	10
Watban	2	23	34
Jaham	1	16	39
Sabah	1	11	23
Kurayn	0	3	6

¹ Including Proved Reserves.² Including Proved and Probable Reserves.

Only one of the 22 untapped fields—Shaybah—has been substantially drilled. The peripheral limits of the field are well defined. As a result, Shaybah accounts for 60 percent of total proved reserves in the fields not yet under production. It comprises 37 percent of probable reserves and 43 percent of possible reserves among these 22 oilfields. It lies, however, about 600 kilometers southeast of Dammam in the Rub Al-Khali (Empty Quarter), a largely uninhabited desert region. The need for a pipeline to link it to existing port-loading facilities and field-maintenance requirements (e.g., for gas injection and water handling) would make exploitation more costly than expanding capacity in currently producing oilfields.

Shaybah was included in an earlier Aramco plan to raise total sustainable capacity in the Aramco areas to 16 million b/d by 1985. It was to have accounted for 500,000 b/d of this total. That plan has since been abandoned because of cuts in investment funding and other constraints, and development work at Shaybah has ceased.

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The other 21 unproduced oilfields have been only marginally explored. Determining the extent of recoverable reserves and whether an oilfield is commercial normally requires at least three or four wells. However, 15 of these fields have only

Saudi Arabia: Types of Wells Located in the Untapped Oilfields 1									
	Total Completed	Completed Wells				Not Completed			
		Abandoned Oil	Observation	Standing Oil	Shut-in Oil	Abandoned Drilling	Drilling	Suspended	
Shaybah									
July 1976	27	1	0	22	2	2	0	1	
March 1977	27	1	0	24	0	2	0	1	
March 1978	28	1	0	25	0	2	0	1	
Rimtham									
July 1976	1	0	0	0	0	1	0	5	
March 1977	1	0	0	0	0	1	0	5	
March 1978	1	0	0	0	0	1	0	5	
Mazali									
July 1976	7	0	1	5	1	0	0	0	
March 1977	7	0	1	5	1	0	0	0	
March 1978	7	0	1	6	0	0	0	0	
Abu Jifan									
July 1976	5	0	3	2	0	0	0	0	
March 1977	5	0	3	2	0	0	0	0	
March 1978	5	0	2	3	0	0	0	0	
Lawbah									
July 1976	2	0	0	0	0	2	0	0	
March 1977	2	0	0	0	0	2	0	0	
March 1978	2	0	0	0	0	2	0	0	
Jurayd									
July 1976	1	0	0	0	0	1	0	0	
March 1977	1	0	0	0	0	1	0	0	
March 1978	1	0	0	0	0	1	0	0	
Suban									
July 1976	0	0	0	0	0	0	1	0	
March 1977	1	1	0	0	0	0	0	1	
March 1978	2	1	1	0	0	0	1	1	
Meherah									
July 1976	1	0	0	0	0	1	0	0	
March 1977	1	0	0	0	0	1	0	0	
March 1978	1	0	0	0	0	1	0	0	
El Haba									
July 1976	2	0	0	1	0	1	0	0	
March 1977	2	0	0	1	0	1	0	0	
March 1978	2	0	0	1	0	1	0	0	
Jana									
July 1976	1	0	0	0	0	1	0	1	
March 1977	1	0	0	0	0	1	0	1	
March 1978	1	0	0	0	0	1	0	1	
Bakr									
July 1976	1	0	0	0	0	1	0	1	
March 1977	1	0	0	0	0	1	0	1	
March 1978	1	0	0	0	0	1	0	1	

Saudi Arabia: Types of Wells Located in the Untapped Oilfields ¹ (Continued)

	Completed Wells					Not Completed		
	Total Completed	Abandoned Oil	Observation	Standing Oil	Shut-in Oil	Abandoned Drilling	Drilling	Suspended
Qirdi								
July 1976.....	1	0	0	1	0	0	0	0
March 1977	1	0	0	1	0	0	0	0
March 1978	1	0	0	1	0	0	0	0
Sharar								
July 1976.....	0	0	0	0	0	0	1	0
March 1977	0	0	0	0	0	0	0	1
March 1978	0	0	0	0	0	0	1	2
Ramlah								
July 1976.....	2	0	0	0	0	2	0	3
March 1977	2	0	0	0	0	2	0	3
March 1978	2	0	0	0	0	2	0	3
Karan								
July 1976.....	0	0	0	0	0	0	0	1
March 1977	0	0	0	0	0	0	0	1
March 1978	0	0	0	0	0	0	0	1
Ribyan								
July 1976.....	1	0	0	0	0	1	0	0
March 1977	1	0	0	0	0	1	0	0
March 1978	1	0	0	0	0	1	0	0
Dibdibah								
July 1976.....	0	0	0	0	0	0	0	1
March 1977	0	0	0	0	0	0	0	1
March 1978	0	0	0	0	0	0	0	1
Habari								
July 1976.....	0	0	0	0	0	0	0	0
March 1977	2	0	0	0	0	2	0	0
March 1978	2	0	0	0	0	2	0	0
Watban								
July 1976.....	1	0	0	0	0	1	0	0
March 1977	1	0	0	0	0	1	0	0
March 1978	1	0	0	0	0	1	0	0
Jaham								
July 1976.....	2	0	0	0	0	2	0	0
March 1977	2	0	0	0	0	2	0	0
March 1978	2	0	0	0	0	2	0	0
Sabah								
July 1976.....	0	0	0	0	0	0	0	0
March 1977	0	0	0	0	0	0	0	0
March 1978	0	0	0	0	0	0	0	0
Kurayn								
July 1976.....	1	0	0	0	0	1	0	0
March 1977	1	0	0	0	0	1	0	0
March 1978	1	0	0	0	0	1	0	0

¹ There are no producing, injection, or water injection supply wells in any of these fields. Standing oilwells will be moved to the "Producing" category when the field comes on stream.

one or two completed wells and three have had no well completions. A few other potential oil-bearing structures have been identified, but these are small and not thought likely to contain any significant reserves.

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Crude Types

The 15 untapped oilfields which we are able to identify by crude types¹ have a reserve ratio of light (Arab Light and "extra light") to heavy (Arab Medium and Arab Heavy) crude fairly similar to those of the oilfields currently in production. However, Shaybah's "extra-light" crude is the largest single crude category. If, as we expect, the

Saudi Arabia: Distribution of Reserves by Crude Type

Type of Crude	Reserves			Name of Field
	Proved	Probable	Possible	
Percent in Producing Oilfields				
Extra Light	6.9	6.3	6.4	Berri
Arab Light	52.3	45.5	42.3	Ghawar, Abqaiq, Fadhili, Abu Hadriyah, Harmaliyah, Damman
Arab Medium	19.2	27.0	28.0	Qatif, Marjan, Zuluf, Berri, Abu Safah, Khurais, Khursaniyah
Arab Heavy	21.6	21.2	23.3	Safaniya, Manifa
Total	100.0	100.0	100.0	
Percent in Untapped Oilfields				
Extra Light	60.0	37.5	43.4	Shaybah
Arab Light	1.7	2.3	3.3	Jana, Qirdi
Arab Medium	21.8	37.0	27.7	Mazali, Abu Jifan, Lawhah, Suban, Maharah
Arab Heavy	16.5	23.2	25.6	Rimthan, Jurayd, El Haba, Bakr, Sharar, Ribyan, Dibdibah
Total	100.0	100.0	100.0	

Saudis reduce the allowable production ratio of Arab Light to other crudes from 65 percent of the total to 55 or 50 percent in the next couple of years the reduced availability of Saudi light crudes may eventually make the development of Shaybah commercially attractive. This assumes, however, that this crude type (similar to Berri) will not fall within quotas established by the Saudis. (Confidential Noform)

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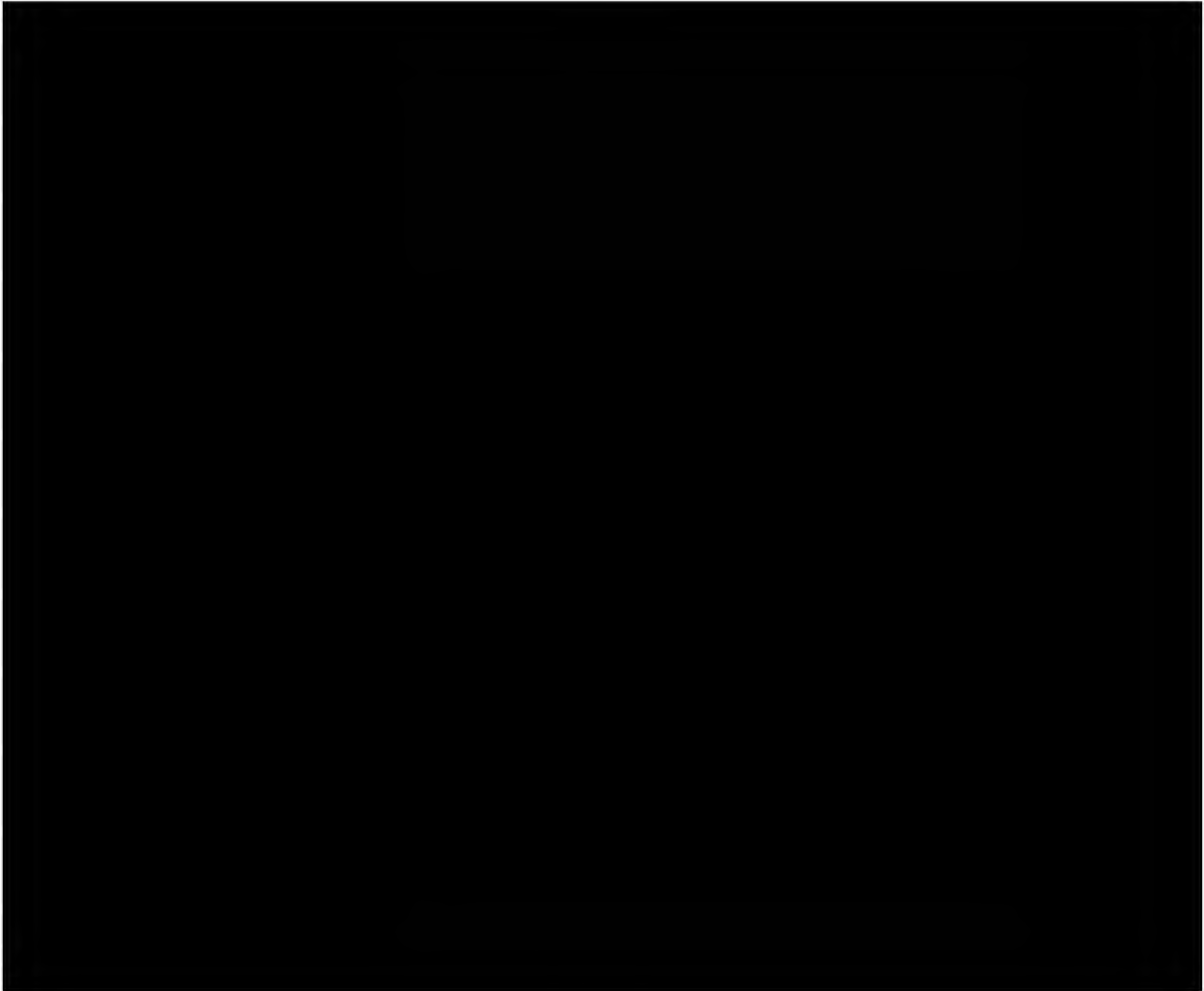
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USSR: DEVELOPMENT OF THE GAS INDUSTRY *

Soviet natural gas production will continue to grow rapidly and to provide the USSR with a growing source of energy for domestic use or export through the 1980s.

- Soviet natural gas reserves of 28 trillion cubic meters (cu m) are possibly the world's largest and would provide more than 80 years output at the 1977 production level of 346 billion cu m per year.

* This article summarizes the key judgments of the research paper *USSR: Development of the Gas Industry*, ER 78-10393, July 1978, unclassified.

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- Gas extraction grew from 12 billion cu m in 1956 to 346 billion cu m in 1977, an impressive average annual rate of 17 percent, and should continue to grow at about 6 percent a year into the 1980s, reaching 415 billion to 420 billion cu m in 1980, 560 billion to 600 billion cu m in 1985, and possibly more than 700 billion cu m by 1990.
- The Soviet gas trunkline system now extends well over 100,000 kilometers (km), linking major gasfields in West Siberia and Central Asia with Soviet and European consumers. Although the Soviets do not yet possess a gas distribution system capable of satisfying all consumer needs year-round, they have made some progress in that direction.
- Natural gas will become an increasingly important hard currency earner for the Soviets in trade with the West. It already is a major factor in the Soviets' position as chief energy supplier to Eastern Europe.
- Gas will contribute more than any other fuel to increments in total Soviet energy production between now and 1990. By 1990 it could constitute the largest single source of domestically produced energy.

Development of the Soviet gas industry through the 1980s will focus on West Siberia.

- Gas production at older fields in the European USSR has begun to decline fairly steeply and growth in Central Asia has slowed.
- West Siberia's northern Tyumen' Oblast holds over two-thirds of Soviet gas reserves, and new discoveries are continuing to add to the region's reserves.
- Present Soviet plans call for West Siberian gas production to increase from 68 billion cu m in 1977 to more than 150 billion cu m in 1980.
- The region will account for up to 80 percent of all additions to Soviet gas production during 1976-80 and will provide virtually all increases in output in the 1980s.

Several persistent problems will confront the Soviet gas industry in the next decade, restraining growth in output and raising costs of gas extraction and transport.

- Pipeline capacity has continually lagged behind drilling and has caused the

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gas industry to fail to fulfill annual and five-year plans. It probably will be responsible for below-plan production in 1980.

- Inadequate compressor power is a principal bottleneck in expansion of pipeline capacity and will remain so at least through 1980. Constructing pipelines in permafrost has also required increased time plus greater investment—particularly in Western large-diameter pipe—and the costs of gas transport are rising substantially.
- Gas extraction costs, already rising faster than those of any other Soviet energy industry, will continue to grow markedly. Increasing well depths—particularly in older producing regions—are a major cause, as are the high costs of gasfield development in the Siberian arctic.
- West Siberia's northern Tyumen' Oblast will become the source of most of the gas industry's future problems as well as the base for production growth. Inadequate infrastructure and technical difficulties posed by drilling, pipe-laying, and pipeline operation in the severe climate probably will limit the development pace.
- The older fields in the European USSR and Central Asia will become an increasing drag on national gas production, absorbing a continued high level of investment while output stagnates or declines.
- Soviet shortcomings in production of large-diameter gas pipe, compressor stations, and exploration, drilling, gas processing, and other equipment will lead to continued Soviet dependence on imports from the West.

Natural gas will not prove a panacea for Soviet energy problems caused by a future decline in oil production.

- Gas will prove difficult to substitute for oil in several sectors of the Soviet economy, particularly agriculture and transportation. Gas consumption will continue to grow in industry, where its use is already substantial. Electricity generation will also provide a significant area of gas-for-oil substitution in the early 1980s.
- Gas will not match oil as a hard currency earner by 1980, although it probably will become the leading Soviet trade commodity well before 1985, earning several billion dollars a year. (Unclassified)

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CHARTERING FLURRY BUOYS TANKER RATES

Increased chartering activity in all major loading areas has pushed the Mullion Index for voyage charters in the crude trades to Worldscale 80, its highest level since the yearend 1977 rush to move oil cargoes before the anticipated OPEC price boost. The current firming trend in charter rates began in the Persian Gulf, where average rates for shipments to Europe on very large crude carriers (VLCCs) have risen from \$3.38 per ton in early June to more than \$6.76 a ton, as of 18 August 1978. At these levels the efficient owner with tankers in operation is better off hiring his ships out than keeping them idle or putting them into lay-up. Operating costs are covered, but most capital costs are not.

Voyage-chartered ships carry less than one-half of the oil loaded in the Gulf. Ships owned and time-chartered by the oil companies carry a majority of the cargoes. The volume carried in voyage-chartered ships varies considerably from week to week because shippers use such vessels for their marginal requirements.

Voyage chartering on the Gulf-to-Europe route reached a historic high of 4.3 million tons during the week ending 4 August, up from around 1.3 million a week the previous month, but slumped again during the week ending 11 August to 1.8 million tons. Adding to the pressure of increasing demand, the short-term supply of ships available for charter in the Gulf (operational tankers waiting for business) dropped sharply from 3 million deadweight tons (dwt) as of mid-June to 0.8 million dwt in mid-July and was probably eliminated entirely by early August.

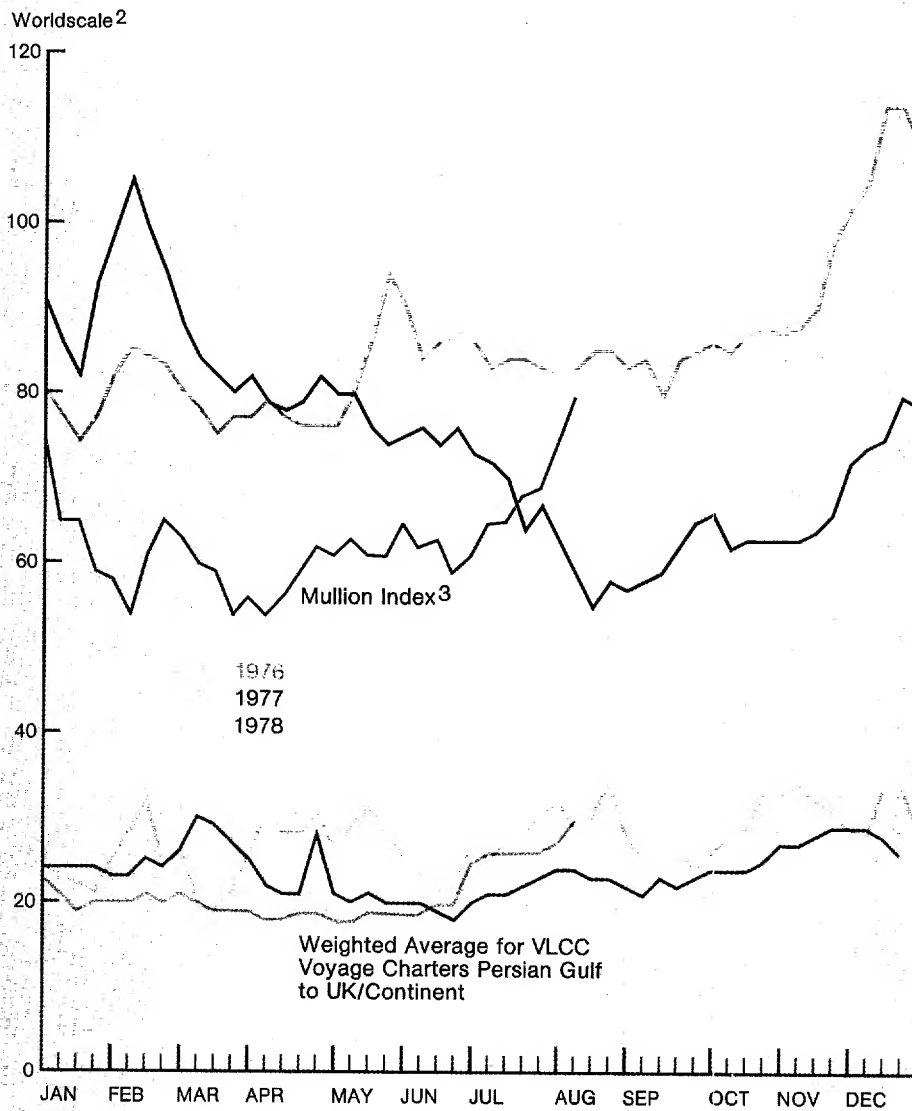
By mid-July the revitalization of the tanker charter market had spread to the Mediterranean, Caribbean, and West African loading areas where both voyage-charter volumes and rates have also risen. Rate increases have been tempered by a larger short-term supply of tankers in these regions.

The increase in voyage chartering reflects a rise in loadings rather than a shift to oil company owned or controlled tonnage. Resurgence in demand has been attributed in some quarters to an early initiation of advanced liftings in anticipation of an OPEC price increase. Japan's implementation of its scheme to store oil in large tankers has undoubtedly put short-term pressure on rates. This program involves only 5 million dwt of tankers, however, at a time when the worldwide surplus is close to 150 million dwt.

Ironically, the current market upturn began just as the tonnage of laid-up oil carriers was reaching a record high—56 million dwt at the end of June. Even though

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Voyage Charter Rate Indexes¹



1. These indexes apply only to charters for the carriage of so-called "dirty" cargoes which include crude oil and heavy petroleum products such as residual fuel oil.

2. A table of oil shipment costs on various trade routes for a standard tanker with fixed parameters (size, speed, fuel consumption, manning requirements, etc.) used on the tanker market to express voyage charter rates.

3. This index reflects all rates available to the compilers (the London tanker brokerage Mullion and Company) for single voyage charters of tankers in all trades agreed to (fixed) during the week in question and all previously fixed single voyage charters still in effect on Friday of that week.

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high reactivation costs and uncertainty over the duration of the current chartering wave will discourage many owners from taking tankers out of lay-up, enough owners probably will be returning tankers to service to cause a leveling of rates within a month. (Unclassified)

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